



An Ambient Air Survey for Polychlorinated Biphenyls in Ontario — 1976

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Ministry
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Environment

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AIR RESOURCES BRANCH

TECHNOLOGY DEVELOPMENT AND APPRAISAL SECTION
HAZARDOUS CONTAMINANTS AND RESEARCH PLANNING UNIT

ARB-TDA-REPORT NO. -49 -78

An Ambient Air Survey for Polychlorinated
Biphenyls in Ontario - 1976

Technology Development and Appraisal
Section, Air Resources Branch, Ontario
Ministry of the Environment Jointly with
the Laboratory Services Branch, Organic
Trace Contaminants & Pesticides Sections

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1.0 SUMMARY:

Evidence concerning the presence of PCBs in the atmosphere and concerning the role of the atmosphere in inter-medium mobilization and long-range transport of PCBs suggested that it would be desirable to have a preliminary data base of typical atmospheric concentrations of PCBs in various urbanized, industrialized, and remote areas of the province.

During August and September 1976, the Air Resources Branch, with the cooperation of the Regional Offices and the Laboratory Services Branch, carried out a preliminary survey for ambient airborne polychlorinated biphenyls (PCBs) in the following Ontario cities: Hamilton, Peterborough, London, Toronto, Sarnia, and Windsor. Altogether, forty-seven samples were collected, which consisted of an exposed 47 mm diameter glass fibre pre-filter (to collect particulate matter) in series with an exposed adsorbent-filled tube (to collect vapour-phase material). Sampling periods ranged from 16 to 24 hours.

Samples were returned to Toronto within a few days (at most) after exposure and analysed by the Pesticides Unit, Organic Trace Contaminants Section (later separately organized as the Pesticides Section), Laboratory Services Branch. Cartridges were either extracted immediately and the extracts refrigerated prior to analysis or refrigerated themselves temporarily, before being extracted. Filters were stored temporarily at room temperature, extracted, and the extracts refrigerated (up to several weeks) prior to analysis.

The analytical results indicated a detection limit of 1 to 2 nanograms per cubic meter (ng m^{-3} or $\text{ug}/1000 \text{ m}^3$) of material collected on the cartridges and 0.2 to 0.3 ng m^{-3} of material collected on the prefilters.

Samples from the three surveyed cities in which PCB-processing plants are located (Hamilton, Peterborough, London) contained somewhat higher concentrations of PCBs than the other three cities surveyed. The overall range of concentrations (quantified by comparison with mixtures of various commercial "Aroclor" products) was from less than the detection limit ($\sim 1\text{-}2 \text{ ng m}^{-3}$) to about 30 ng m^{-3} , the latter being collected near a PCB processing plant. 40 per cent of the cartridge samples had PCB concentrations less than the detection limit.

In almost all sample sets, the largest fraction of PCBs appeared on the cartridges, compared with the corresponding filters. This reflects either that the majority of PCBs was in the vapour phase in the atmosphere or that originally adsorbed PCBs were stripped from the particulate matter to the cartridge by the sampled airstream (See Section 8.0, Discussion).

The objective of the survey was achieved in that a range of concentrations of airborne PCBs was determined for typical atmospheric and urban/industrial land-use conditions. The concentrations presented in this report should be interpreted in this light; that is, they are not long-term, representative air quality data but are baseline data against which future measurements can be compared.

No attempt is made to interpret the significance of human or other exposures to these ambient levels.

2.0 CONCLUSIONS AND RECOMMENDATIONS:

2.1 Conclusions:

The results of the 1976 survey for airborne polychlorinated biphenyls (PCBs) in six Ontario cities lead to the following conclusions:

- (1) Measurable concentrations of PCBs (quantified as commercial Aroclor mixtures) were found in some samples in all six cities.
- (2) The measured concentration of PCBs ranged from less than 1 nanogram per cubic meter (ng m^{-3} or $\text{ug}/1000 \text{ m}^3$) to about 30 ng m^{-3} . The mean value (for samples in which PCBs could be detected) ranged from about 4 ng m^{-3} in Toronto and Windsor to about 11 ng m^{-3} in Hamilton.
- (3) Typical urban ambient concentrations of PCBs away from known sources were in the range of approximately 1 to 3 ng m^{-3} .
- (4) In all cases, the majority of the total PCB concentration was contributed by vapour-phase material, that is, PCBs collected on the sorbent-filled cartridge. PCBs on the particulate matter collected on the prefilter comprised only about 10% of the total for any sample, on the average, the rest having passed through the filter to the adsorbent cartridge. This comparison is possible only for 13 pairs of samples consisting of filter and cartridge, on which PCBs could be quantitated simultaneously, but it is consistent with other reported results (see main text). Tentatively, then, one can conclude that either the PCBs were present in the atmosphere predominantly in the

form of vapours at the time of sampling or that the material collected on the adsorbent cartridge came partly from material originally adsorbed on particulate matter but stripped from it in the course of sampling.

- (5) The low-volume sampling method used in this survey (10-15 m³ of air sampled in 24 hours) collects sufficient material to achieve an analytical sensitivity of about 0.2 ng m⁻³ for PCBs on filterable particulate matter and 1 to 2 ng m⁻³ for vapour phase PCBs on the Tenax GC^(R) resin-filled cartridge. Subsequent to the survey described here, modification of the adsorbent cartridge design and substitution of Florisil^(R) adsorbent for Tenax GC now permit semi-quantitative analysis of low-volume cartridge samples to about 1 ng m⁻³. These changes are described in a separate report on sampling methods for airborne organic compounds (Report ARB-TDA-51-78, "Sampling Procedure for Airborne Polychlorinated Biphenyls").
- (6) Airborne PCBs, either particulate or vapour-phase, seldom resemble commercial PCB fluids in their isomeric chemical composition except near points of direct atmospheric discharge. This occurs because of different rates of environmental aging (degradation) of the various chlorinated biphenyl isomers in the commercial mixtures. The effect of the atypical isomer abundance distribution is to make the analysis more uncertain, since quantification depends upon gas chromatographic peak pattern (fingerprint) matching, and subsequent summation of corresponding peaks for sample and standard.

2.2 Recommendations:

The following recommendations are based on the Results and Conclusions sections of this report and to a certain extent

on experience in ambient air sampling of PCBs gained since the 1976 survey.

- (1) The low-volume sampling train and the associated analytical methods described here are recommended for determining 24-hour average concentrations of PCBs at levels down to 1 ng m^{-3} or less. This sensitivity is sufficient to determine concentrations with reasonable accuracy in all situations except in remote areas of the province or during periods when polar (clean) air is flowing over the region.
- (2) Some development work should be devoted to producing a sampling train which would be capable of collecting a 10 to 15 m^3 sample in a shorter time period than 24 hours, say, 4 to 8 hours. This would require an increase in flow rate by a factor of 3 to 6.
- (3) Emphasis should be placed on developing the perchlorination method of analysis to improve the accuracy and sensitivity of the technique. The complexity of samples of airborne PCBs, as noted in the Results and Conclusions, limits the analytical accuracy and sensitivity. The perchlorination method, which was originally developed in Ministry of the Environment laboratories, converts all of the chlorinated biphenyl molecules in a sample to a single species, decachlorobiphenyl (perchlorobiphenyl), so that quantitation is simpler. The consistency and reproducibility of the method, however, remain to be demonstrated.

- (4) Commercially available Florisil-filled, sealed, sampling cartridges should be evaluated for suitability in ambient air PCB monitoring situations. These tubes contain a much smaller amount of Florisil than has been used in the MOE-design cartridges and may, therefore, not trap enough PCBs to allow quantification to the desired level. They would have the advantages of relatively low cost, pre-packaged convenience, and long shelf life because of the sealed-in-glass design.

3.0 INTRODUCTION:

3.1 Background:

Between 1970 and 1975, the Air Resources Branch sponsored research at Ontario Research Foundation on the collection and analysis of polychlorobiphenyls (PCBs) in the atmosphere. The results were reported in two reports: ORF 72-1 (October 1972) and ORF 75-1 (August 1975). These results indicated that there were measurable concentrations of PCBs in samples of air collected in southern Ontario and that most of these appeared to be in the vapour-phase rather than adsorbed onto particulate matter, or at least that the sampling method collected PCBs predominantly as vapours.

At about the same time, reports appeared in the literature which also indicated that the atmosphere might be a significant medium for the transport of PCBs between environmental compartments. In addition, these findings implied that the atmosphere might also be a significant medium for human exposure through inhalation.

With this background information, it was decided to initiate a program to develop a reliable sampling method for airborne PCBs (none existed in 1975), to adapt existing analytical methods for analysis of samples collected by such a method, and to use these techniques to carry out a preliminary survey at several locations in Ontario. The main objective of the survey would be to determine typical concentrations of airborne PCBs at locations representing a variety of land usage. The survey would be limited in extent and duration and so would not serve as a

representative air quality survey.

At that time there were no regulatory standards or guidelines respecting PCB ambient air concentrations. Knowledge of typical concentrations of airborne PCBs in Ontario and suitable sampling and analytical methods would both be required in supporting documentation for an eventual Ontario environmental air standard.

The sampling train and required analytical method were developed during the winter of 1975-76. The survey was then scheduled for the summer of 1976.

4.0 SURVEY DESIGN:

The following cities were selected for the survey:

- (1) Windsor - urbanization, industrialization, potential for long range transport of PCBs in Detroit's urban plume.
- (2) Sarnia - industrialization
- (3) London - primary PCB - using industry (power transformer or capacitor filling)
- (4) Hamilton- urbanization, industrialization, primary PCB - using industry.
- (5) Toronto - urbanization
- (6) Peterborough - primary PCB-using industry.

Several sampling sites in each city were picked to represent either typical urban or near-source locations (vicinity of known PCB users). At the time of the survey, Ontario had five major industrial plants at which power capacitors or transformers were filled with PCB-containing dielectric fluids, and some of these plants had been in operation for many years. Several other potential sources of direct atmospheric emissions of PCBs were also known, such as an oil refinery high temperature heat exchanger system. The use of PCBs at these sources, of course, is currently being phased out as a result of the prohibition of production (U.S.A.) and eventually of use (U.S.A. and Canada) of PCBs in these applications.

A preliminary account of the work reported here was given at the 70th Annual Meeting of the Air Pollution Control Association held in Toronto during June 1977. The paper was

entitled, "An Ambient Air Survey for Polychlorinated Biphenyls in Ontario" (#77-28.5) and was co-authored by Air Resources Branch and Laboratory Services Branch staff.

5.0 SAMPLE COLLECTION:

5.1 Sampling Method:

Since airborne PCBs are collected predominantly as vapours under the usual conditions of sampling, it was decided to use a sampling train which had been developed by the U.S. Environmental Protection Agency and Research Triangle Institute for collecting samples of ambient organic vapours. Generally, this train consisted of a prefilter in series with a glass or stainless steel cartridge containing Tenax GC^R resin adsorbent and, a vacuum pump and appropriate metering and volume-recording hardware.

The prefilter was 47 mm diameter standard glass fibre, and the sorbent bed dimensions were about 6 cm by 1.2 cm which comprised about 3 gm of 35/60 mesh Tenax GC^R.

The pumping unit, which integrated the pumping, metering and volume measuring functions, was the Nutech Model 221-1A14 portable AC/DC sampler. This sampler was capable of maintaining a 10 lpm flow rate for at least 24 hours on a fully charged 100 amp-hour-rated standard 12 V automobile battery. The sampling time varied between 16 and 24 hours, during which time 10 to 15 m³ of air would be sampled.

The exposed filters were placed in disposable Petri dishes and the adsorption tubes capped prior to transporting them to the MOE Pesticides Laboratory in Toronto for analysis.

The Tenax GC^R material as received was found to be significantly contaminated by PCBs and other heavy organic material. A series of extractions with cool acetone removed most of the contamination from the Tenax without degrading the

physical integrity of the resin.

The cleaned resin was packed in the glass or stainless steel cartridges for field use and extracted with acetone or hexane prior to being capped and distributed. Because of residual contamination, the Tenax cartridge material could be quantified only when 15 to 30 ng or more of PCB had been trapped (1 to 2 ng m⁻³).

The interfering organic residue on the glass fibre prefilters was relatively insignificant, not requiring pre-sampling clean up, and the quantification limit corresponded to about 4 ng of PCB collected on the filter (0.2 to 0.3 ng m⁻³).

The design and testing of the adsorbent cartridge are described in an internal Laboratory Services Branch report, "An Ambient Air Sampler for PCBs" (Report: RDS-7605).

An alternate cartridge design which was used for most of the sampling period is described in a 1977 Ph.D. thesis: "Rapid Analysis of Complex Organic Environmental Mixtures Using Gas Chromatography and Gas Chromatography/Mass Spectrometry/Computer Techniques," by D.W. Denney, Department of Chemistry, University of Waterloo.

5.2 Sampling Sites:

In Hamilton, Peterborough, and London, sites were chosen to ring the major expected PCB sources: Westinghouse Canada Limited transformer-filling plant in Hamilton; Canadian General Electric capacitor-filling plant in Peterborough; and Westinghouse Canada Limited capacitor and transformer-filling plant in London.

Sites in the other three cities were selected to represent typical urban, suburban, or industrial land use.

Table I lists the sampling sites with their coding and a brief site description.

TABLE I.

SITE IDENTIFICATION

Hamilton:

Site

- TA - Taylor Forge, 100 m N of Westinghouse PCB Storage Tank
- DO - Dofasco, Gatehouse at Strathern, 500 m S of PCB tank
- HY - Ontario Hydro Substation - SE corner of Burlington and Strathern, 250 m E of PCB tank.
- HO - Hoffman's Reclaimers, 150 m W of PCB tank

Peterborough:

Site

- 1 Roof of MOE office, 139 George Street (E of CGE)
- 2 Roof of Home Lunch (S of CGE)
- 3 Roof of Power House at Water Tower (W of CGE)
- 4 Roof of Private Garage at 584 Bolivar and Monaghan (N of CGE)

London:

Site

- 1 Western Fairgrounds, Rectory and York, MOE Station 15001
- 2 MOE Station 15003, 362 Dundas
- 3 Roof of Unifin (back), Clarke Side Road (S. of Westinghouse)
- 4 Farm of D. Kernohan, E. of Westinghouse
- 5 Roof of Nieman Wholesale, W. of Westinghouse
- 6 Roof of Garage on Huron St., R.R. 6, N. of Westinghouse.

Toronto:

Site

- AES Atmospheric Environment Service , 4905 Dufferin St., Downsview
- 880 880 Bay Street, Roof
- 070 70 Mornelle Crt., Scarborough

Sarnia:

Site

- 14049 156 Victoria Street, MOE Air Quality
- LIS Corunna, L.I.S. Air Quality Station, "Riverbend"

Windsor:

Site

12008 Roof, 471 University West, MOE Station
12013 Water Filtration Plant, 200 m E Ford Engine Plants, MOE Station
12015 Water Pollution Control Plant, MOE Station

5.2.1. Site Locations (Maps):

Figures 1 through 6 depict the locations of all the sampling sites used during this survey.

5.3 Meteorological Data:

No meteorological data were recorded during this survey. It was thought that, since continuous recording instrumentation for wind speed, wind direction and temperature was not available, there was little point in making fragmentary observations (estimates) of these parameters. It should be recalled that samples were collected over 24-hour periods, during which winds would shift considerably, and that each site was used on only one or two days, so no "upwind-downwind" distinctive trends would be discernable in any case.

Future air quality surveys aimed at monitoring specific sources should, of course, take cognizance of the local meteorological data.

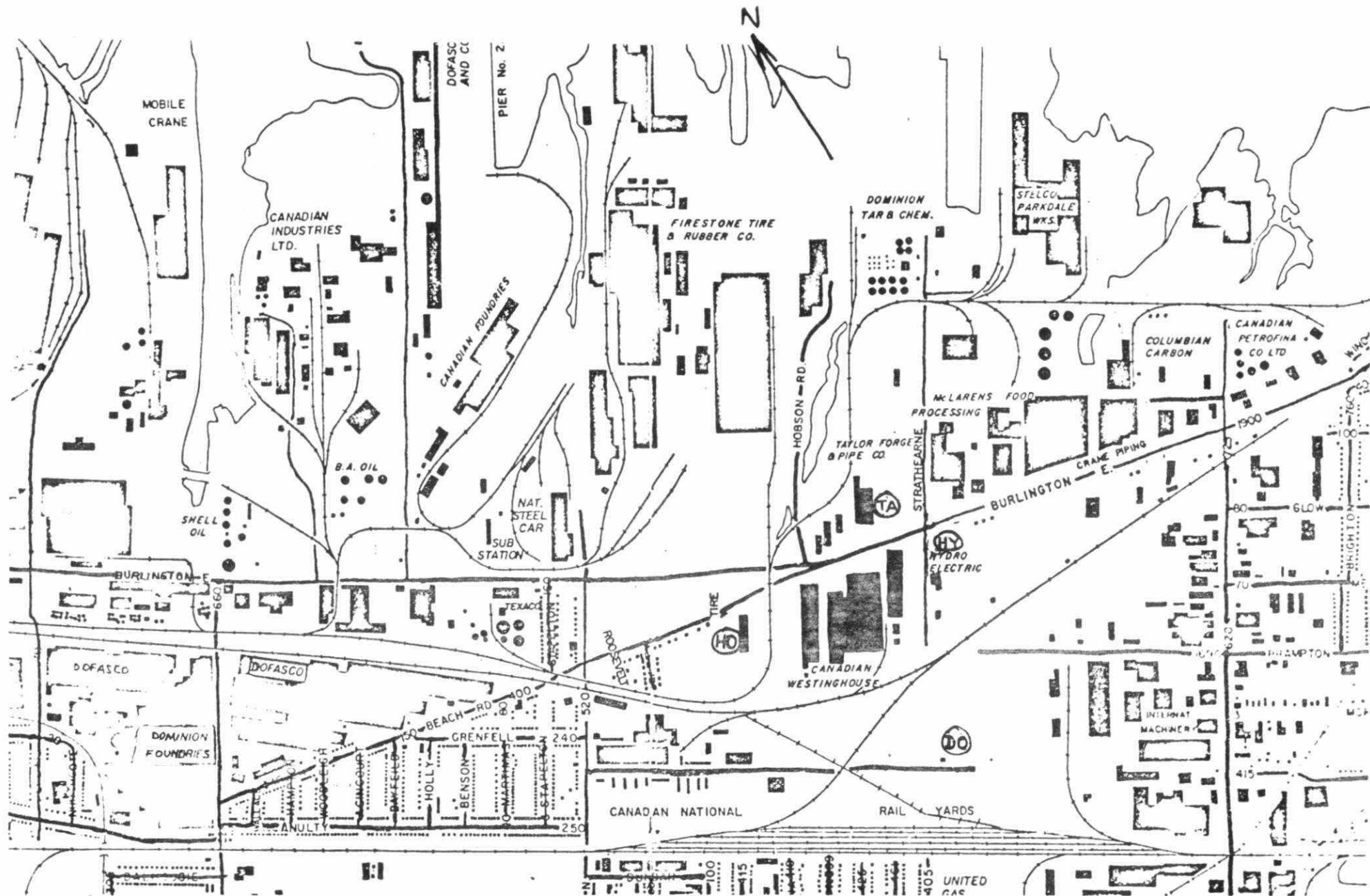


Figure 1: Locations of Sampling sites in Hamilton

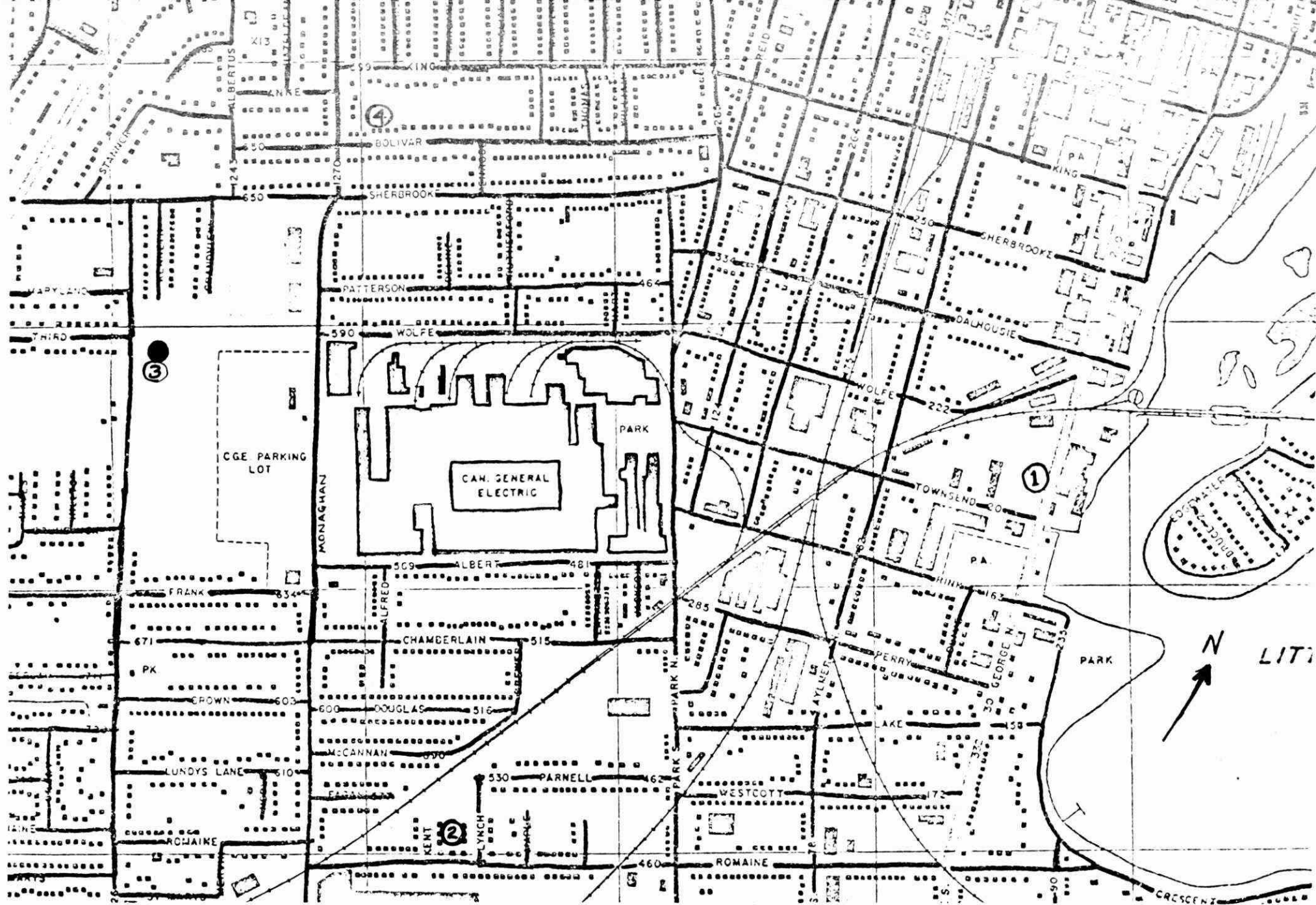


Figure 2: Peterborough Sampling Sites

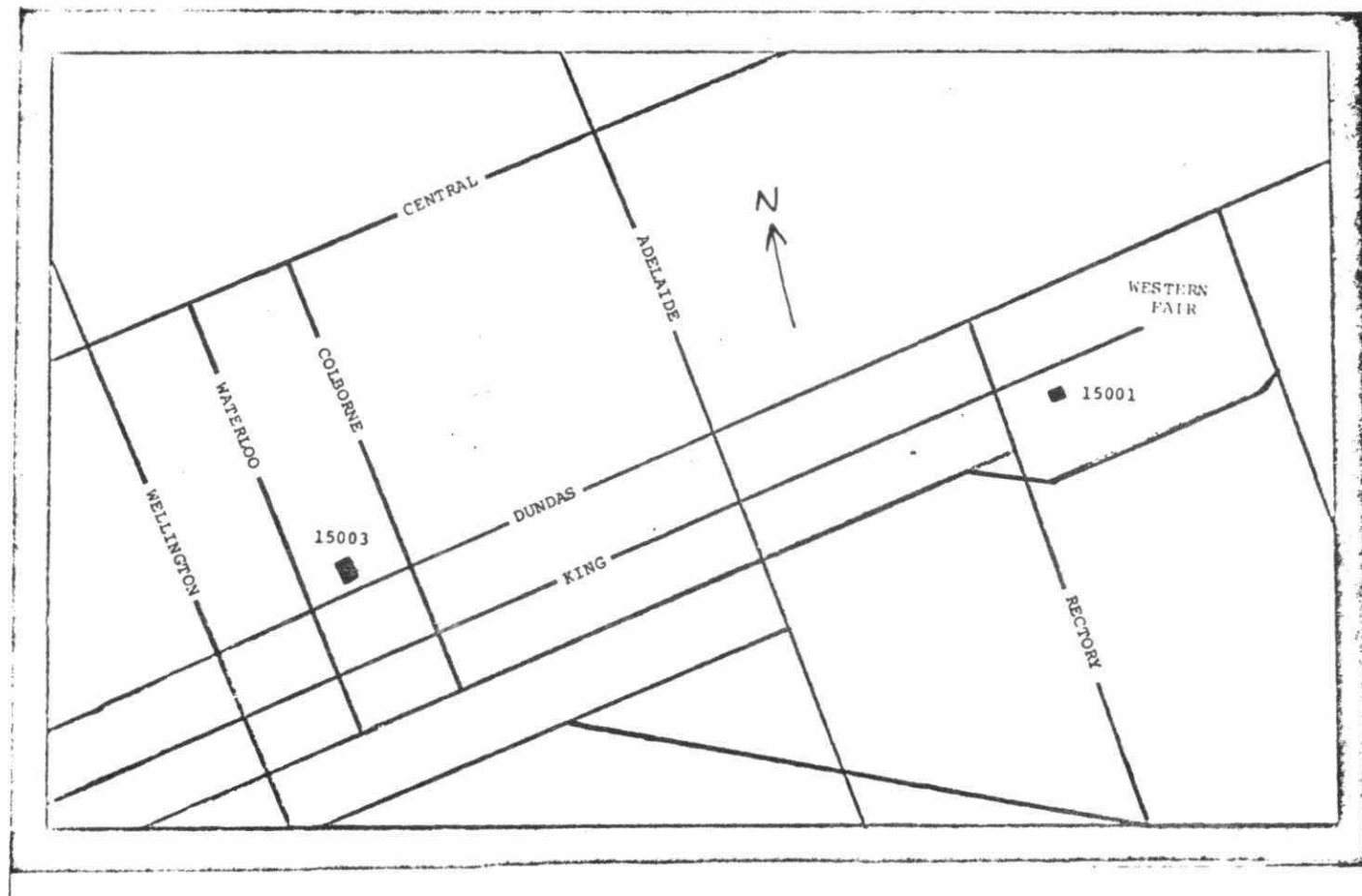


Figure 3A. Locations of sampling sites in downtown London

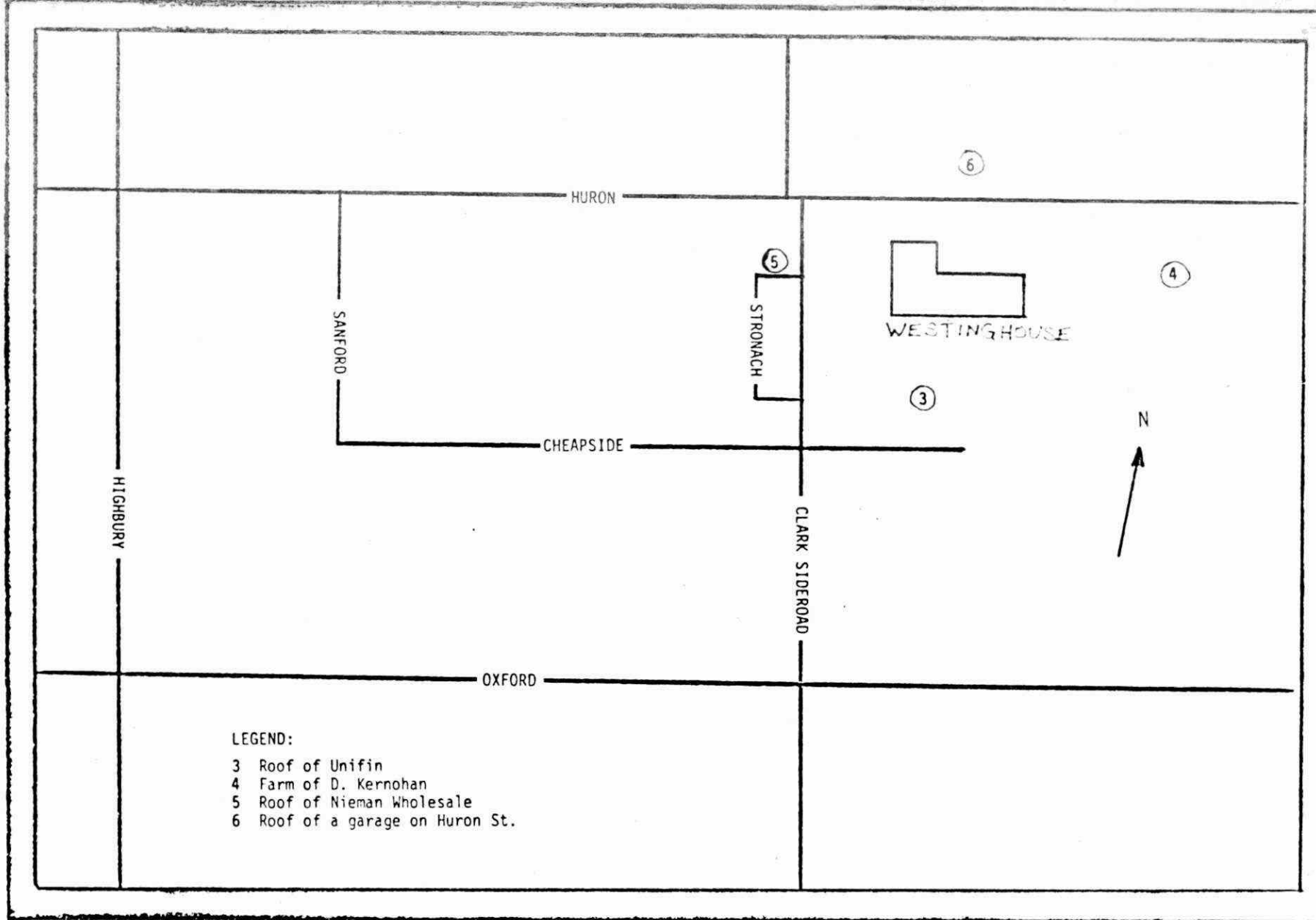


Figure 3B. Locations of Sampling Sites Around Westinghouse, London

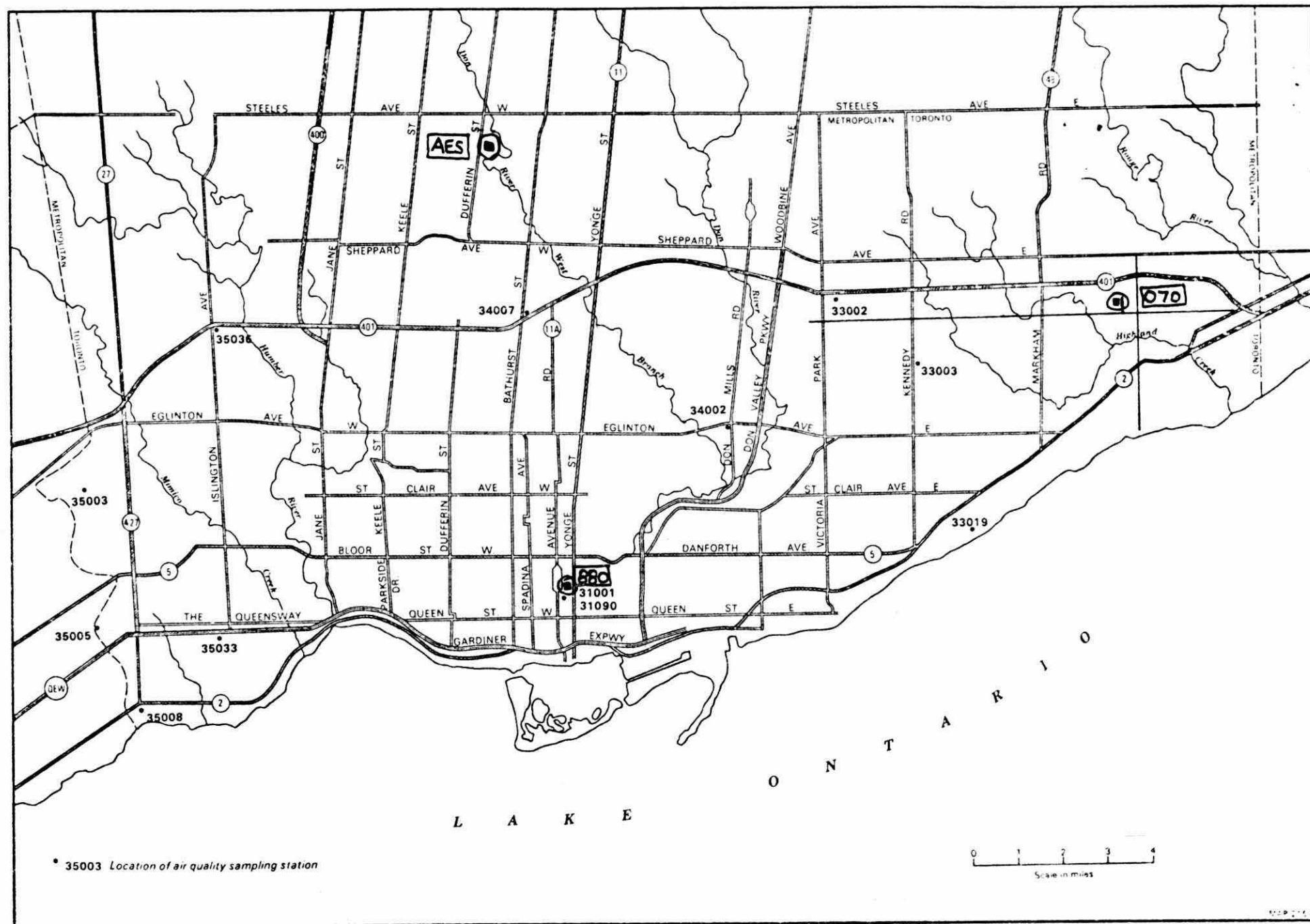


Figure 4. Locations of sampling stations in Metropolitan Toronto.

LAKE HURON

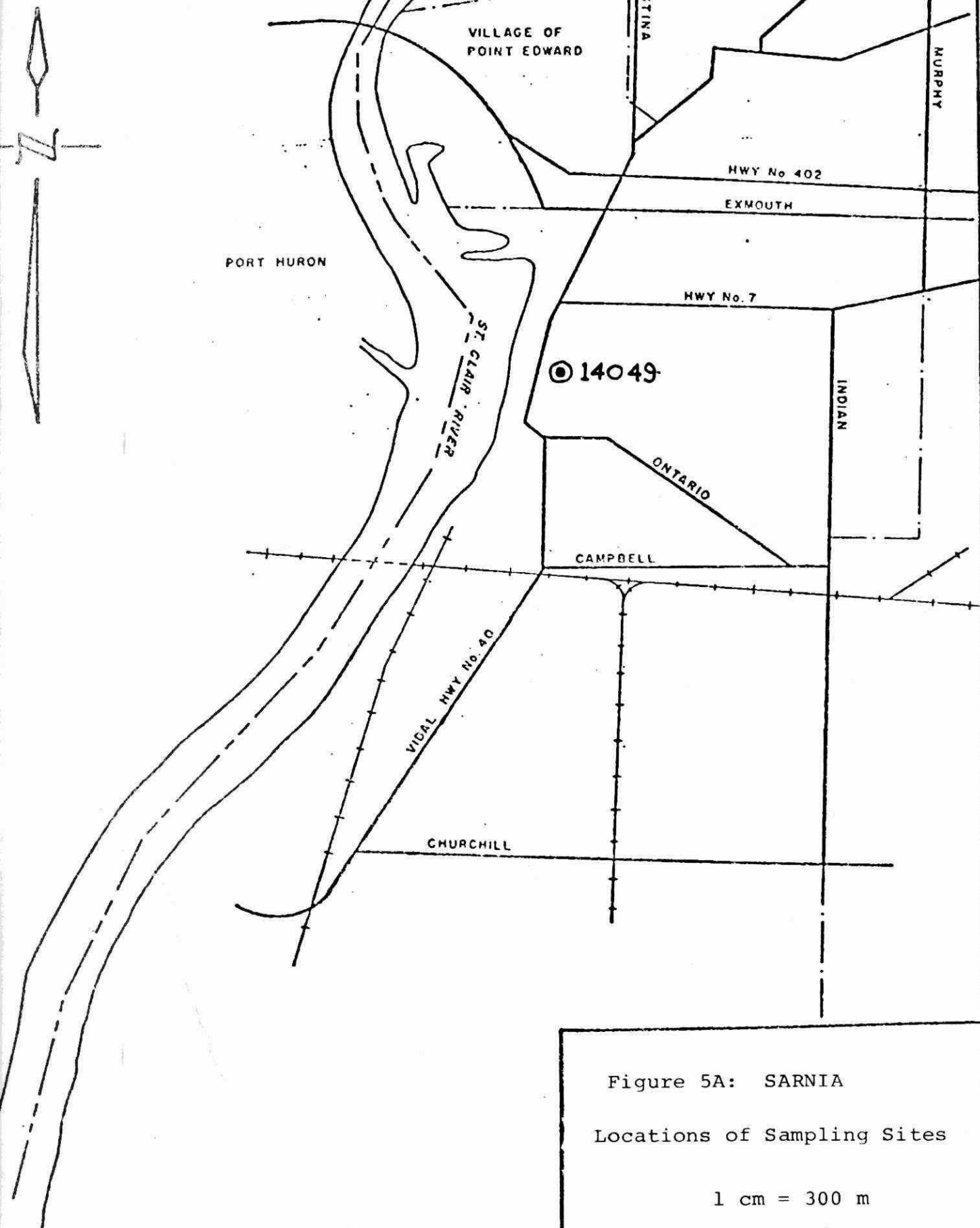


Figure 5A: SARNIA

Locations of Sampling Sites

1 cm = 300 m

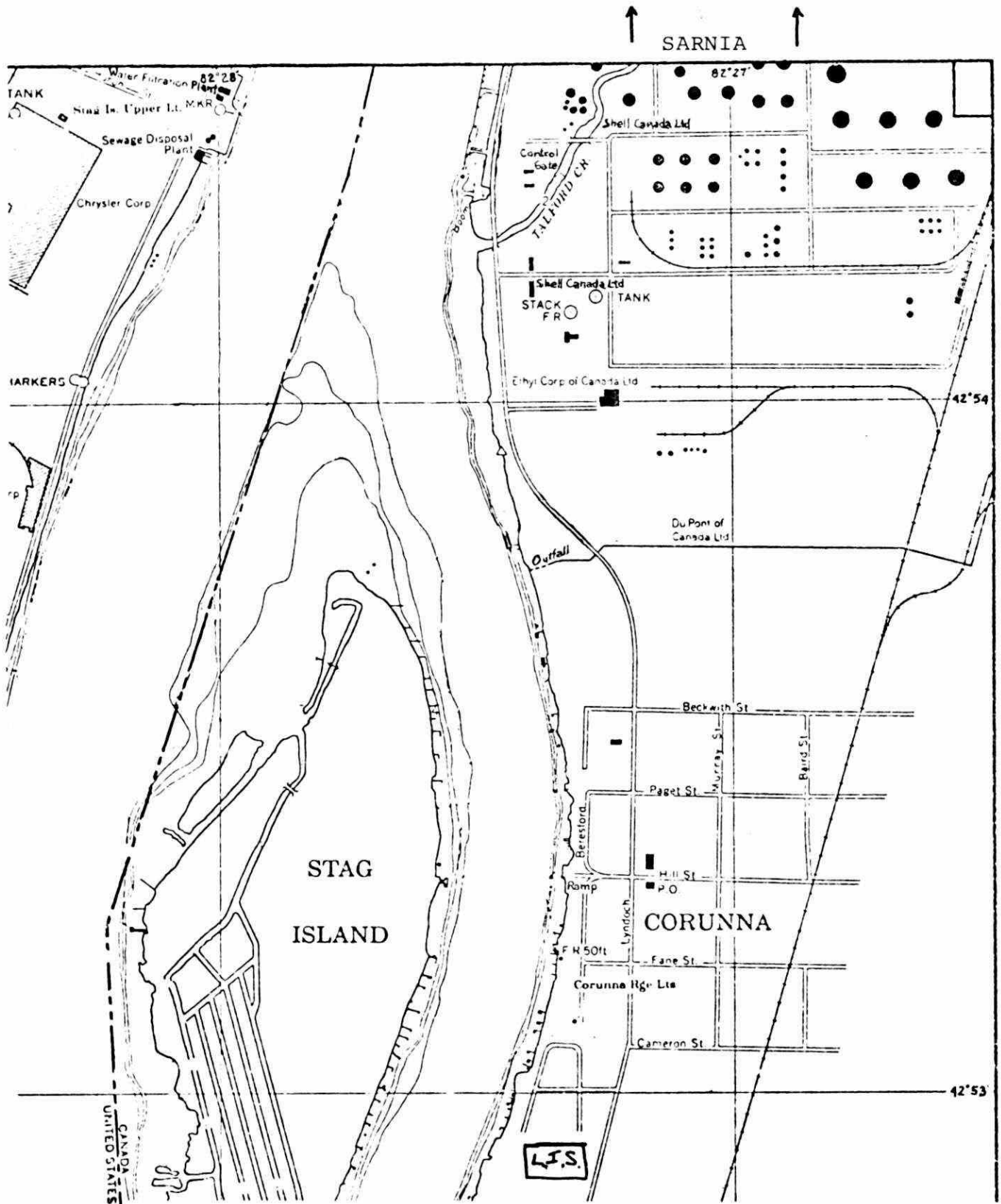


Figure 5B: Location of Corunna Site: Lambton Industrial Society Air Quality Station "Riverbend"

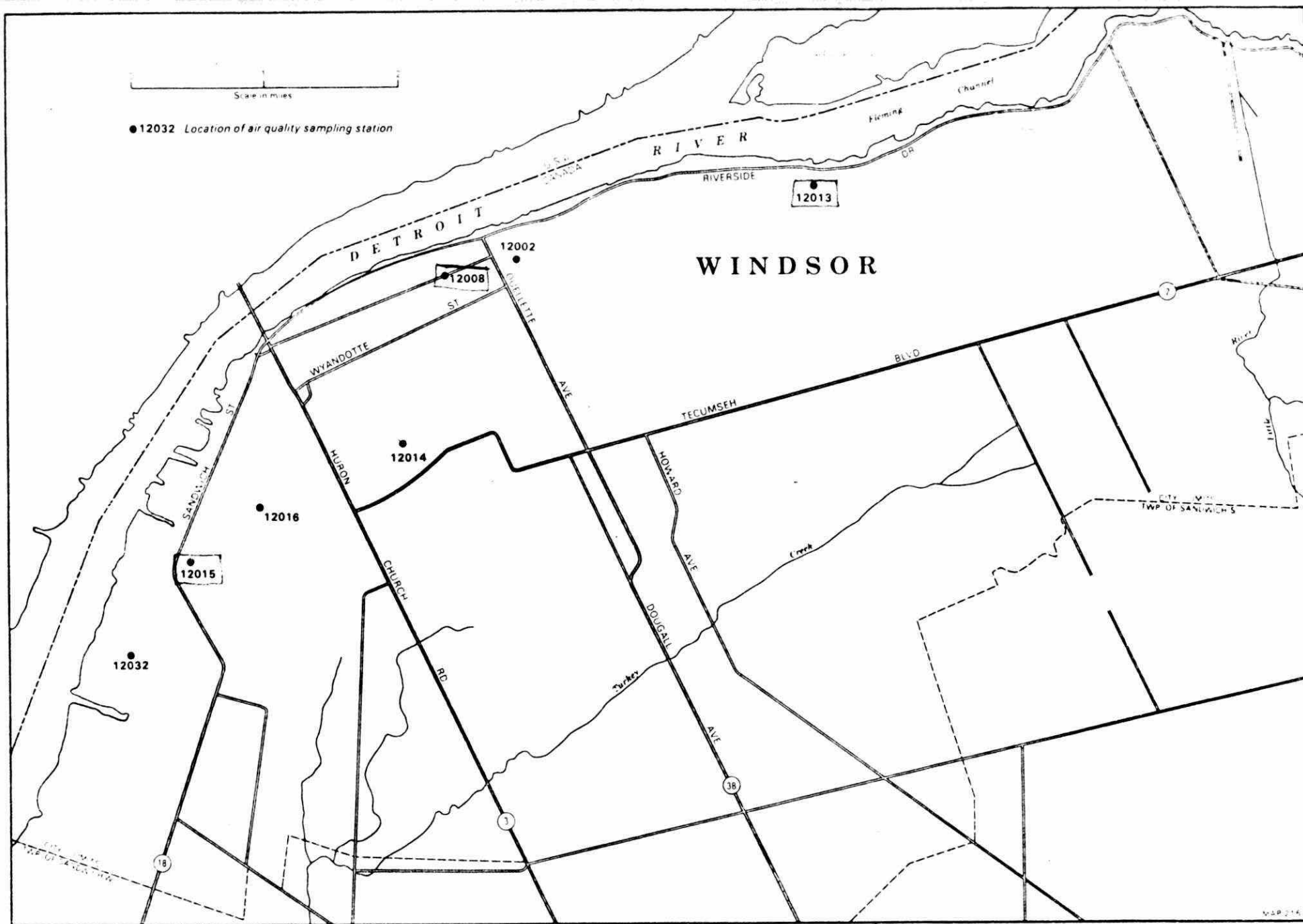


Figure 6. Locations of sampling stations in Windsor.

6.0 CHEMICAL ANALYSIS METHODS:

After exposure, filters were extracted by an 80:1 mixture of pesticide grade benzene and iso-octane for 16 hours in a Soxhlet apparatus. Cartridges were eluted by a single 50 ml aliquot of pesticide grade n-hexane.

The extracts of both filters and cartridges were subjected to the following analytical procedures.

The extract was evaporated on a rotary evaporator in a stream of purified air to give a residue that was then redissolved in one ml of hexane and applied to a Florisil column prepared as follows. The hexane-wetted, activated Florisil column (PR grade, 60/100 mesh, 160 x 6 mm, activated at 130°C) was pre-washed with 30 ml of hexane. The concentrated extract was applied to this column and the PCBs were eluted with 30 ml of n-hexane. The eluate volume was reduced to 0.2 ml. Five μ l were then injected into both channels of the gas chromatograph. This instrument was a Varian Model 2860 equipped with dual electron capture detectors (Sc^3H_3). The GC columns were (a) 6ft (1.9m) x 2 mm, packed with 3% Dexsil 300 GC on Chromosorb W HP, 80/100 mesh, and (b) 6ft. (1.9m) x 2 mm packed with 1.5% OV-17 and 2% QF-1 on Chromosorb W HP, 80/100 mesh.

The GC instrument parameters were as follows:

Column Temperature	212°C
Injector Port Temperature	230°C
Detector Foil Temperature	265°C
Carrier Gas (N_2) Flow Rate	40 ml min ⁻¹
Electrometer Setting	1 x 10 ⁻⁹ amp mv ⁻¹

Using a minimum of eight well-resolved peaks on the chromatograms, the instrument was calibrated in terms of a mixture of one or more of Aroclors^(R) 1242, 1248, 1254 and 1260, selected to closely

match the range of PCB components present in the sample under examination.

The quantification limit using these techniques was about 0.1 ng per injection, compared with a detection limit of about 0.02 ng per injection.

7.0 RESULTS:

Table II presents the analytical results in the form of the raw data, which represent approximately 46 sample pairs of prefilter + cartridge. The uncertainty in the concentrations is about 20 to 30% near the quantitation limit and about 10% at the higher concentrations.

The chromatogram patterns were highly variable and did not usually correspond to one specific Aroclor^R fingerprint. A mixture of AR 1248 and 1254 often approximated the pattern of observed peaks, but occasionally peaks which are prominent in AR 1260, or less often 1242, chromatograms appeared. These results demonstrate, although rather tentatively, that airborne PCBs (both vapor and particulate) are complex mixtures of PCB isomers not resembling very closely those of any particular commercial formulations. The implications of this point will be discussed below.

Table III summarizes important features of the data: mean values, ranges, relative apparent vapor/particulate partitioning, etc.

TABLE II

RESULTS (DATA)^d

CITY	SITE (a) IDENTIFICATION	DATE(s) (1976)	PREFILTER (b) (ng m ⁻³)	CARTRIDGE (b,c) (ng m ⁻³)
Hamilton	TA	August 3,4	NA	29
	DO	August 3,4	NA	1
	IY	August 3,4	NA	2
	HO	August 3,4	NA	21
	TA	August 24/25	1.2	7
	TA	August 25/26	0.7	4 (TR)
	HO	August 24/25	1.4	3 (TR)
	HO	August 25/26	5.8	6
	DO	August 24/26	0.3	< 1 (ND)
	DO	August 25/26	0.5	2 (TR)
	HY	August 24/25	0.3	3 (TR)
	HY	August 25/26	0.3	3
Peterborough	1	August 10/11	0.5	NA
	2	August 12/13	0.7	< 1 (ND)
	2	August 10/11	0.8	< 1 (ND)
	2	August 12/13	0.3	3
	3	August 10/11	0.5	2
	3	August 12/13	0.2	10
	4	August 10/11	0.3	NA
	4	August 12/13	0.3	2 (TR)
London	1	August 17/18	0.2	1 (TR)
	2	August 17/18	0.3	4
	1	August 19/20	0.3	2 (TR)
	3	August 17/18	0.4	2 (TR)
	3	August 19/20	0.3	< 2 (ND)
	3	August 30/31	0.3	< 1 (ND)
	4	August 17/18	0.3	< 2 (ND)
	4	August 19/20	0.2	2 (TR)
	4	August 30/31	0.3	1
	5	August 17/18	0.3	< 2 (ND)
	5	August 19/20	0.3	10
	5	August 30/31	0.2	NA
	6	August 17/18	0.2	< 3 (ND)
	6	August 19/20	0.3	< 3 (ND)
Toronto	AES	August 26/27	0.3	5
	880	August 26/27	NA	2
	070	August 26/27	0.3	2 (TR)
Sarnia	14049	August 30/31	0.3	1 (TR)
	14059	August 30/31	0.3	< 1 (ND)
	14049	August/Sept. 31/1	0.3	4
	14059	August/Sept. 31/1	0.3	1 (TR)

Table II (Cont'd)

CITY	SITE (a) IDENTIFICATION	DATE (s) (1976)	PREFILTER (b) (ng m ⁻³)	CARTRIDGE (b,c) (ng m ⁻³)
Windsor	12008	September 1/2	0.3	1 (TR)
	12008	September 2	0.4	< 1 (ND)
	12013	September 1/2	0.5	< 1 (ND)
	12013	September 2/3	0.3	1
	12015	September 1/2	0.3	1 (TR)
	12015	September 2/3	0.4	6

Notes:

- (a) See Table I
- (b) NA = not analysed
- (c) (TR) = trace quantity found
(ND) = no PCB detected
 < = less than quantification limit (quantitative analysis not possible)
- (d) Prefilter extracts quantified as mixtures of Aroclor^R 1242, 1248, 1254, and 1260.

Cartridge extracts quantified as 50/50 mixture of Aroclor 1254/1260 (traces of Aroclor 1242 and 1248 appeared).

TABLE III. SUMMARY OF RESULTS FOR SAMPLES IN WHICH PCBs WERE DETECTED

<u>Location</u>	<u>Cartridge</u> ^(a)	<u>No. of</u> <u>Samples</u>	<u>Filter</u> ^(a)	<u>No. of</u> ^(b) <u>Samples</u>	<u>Mean Percent PCB on</u> ^(b) <u>Filter</u>
Hamilton	10(3-29)ng m ⁻³	7	1.3(0.3-5.8) ng m ⁻³	8	24% (3)
Peterborough	5(2 - 10)	3	0.5(0.2-0.8)	8	10(3)
London	5(1 - 10)	3	0.3(0.2-0.4)	14	11(3)
Toronto	3.5 (2-5)	2	0.3	2	6(1)
Sarnia	4	1	0.3	4	7(1)
Windsor	3.5(1-6)	2	0.4(0.3-0.5)	6	15(2)

Footnotes:

(a) Mean of samples in which PCB could be quantified (range)

(b) Results for each filter/cartridge pair simultaneously quantifiable (number of pairs).

8.0 DISCUSSION:

This work and preliminary findings of both the Ontario Research Foundation and the U.S. EPA indicate that concentrations of PCBs in atmospheric aerosols can be as high as 30 (this study) to 50 ng m⁻³ in inland industrialized areas and quite typically may be 1 to 3 ng m⁻³. For comparison, it should be noted that 1 ng m⁻³ PCB in the vapor phase (as Aroclor^(R) 1242) is equivalent to about 0.1 part per trillion by volume (ppt). These concentrations may be significant considering the ubiquity of PCBs and their apparent longevity in the atmosphere. The implications for intermedium transport and chemical transformation in the environment clearly depend upon the properties of aerosols containing PCBs.

The data produced by the present study cannot be considered representative in the usual sense of continuous air quality monitoring data. It appears, however, that the highest average levels of PCBs in Ontario occur in those cities in which PCB processing facilities are located (Hamilton, Peterborough, London) and are typically somewhat lower elsewhere. Each of the four sampling sites represented in the results for Hamilton, for example, was within 100 to 500 meters of a PCB storage area associated with capacitor or transformer primary filling processes.

General interpretation of the distribution of PCBs between the vapour and particulate phases of the atmospheric aerosol in terms of a realistic model of sources, sinks and transport mechanisms will depend upon obtaining many more data like those reported here. All studies of atmospheric PCBs so far reported have found the PCBs to be predominantly in the vapour phase, as determined by several quite different sampling methods. Considering that PCBs likely enter the atmosphere through evaporation or incomplete incineration

processes, and that they have significant vapor pressures at ambient temperatures, it would not be too surprising that they might appear in the vapor phase predominantly. Conventional wisdom suggests however that PCBs would adsorb onto atmospheric particulates like polycyclic aromatic hydrocarbons and other organic materials which originate in the vapor phase. The data from the present study are too limited to elucidate this point.

The main point is that in order to collect a representative sample of total atmospheric PCB loading, it is necessary to use a method which collects both particulate matter and PCB vapours quantitatively.

This study confirms the results of other that PCBs are present in measurable concentrations in the atmosphere near urban and industrial areas and that the majority of PCBs are found typically as vapours. The latter conclusion remains to be critically tested in laboratory or field studies.

Experience with the EPA organic vapor sampling train has been good. It appears, however, that Tenax GC^R is not an appropriate adsorbent for PCBs because of contamination of some batches of the resin. Subsequent field and laboratory work with Florisil-packed cartridges (30/60 mesh) has indicated that this material is much more suitable for use with heavy organics because it can be thoroughly cleaned by high temperature treatment. Under the conditions described above for PCB sampling and analysis, the Florisil-filled cartridge produces essentially no background of PCBs or other heavy organic material. This means that the quantitation limit for PCB vapor in a 10 to 15 m³ sample of air would be roughly the same as for the filtered material, that is, about 0.3 ng m⁻³ for collected PCBs with a composition essentially identical to standard Aroclor 1242. For field samples containing a non-standard mixture of different (heavy) chlorinated biphenyl

isomers, the sensitivity degrades to about 1 ng m^{-3} . The latter number should be taken as typical operating sensitivity. Even greater sensitivity can be achieved at the expense of losing the fingerprint pattern of PCB chromatogram peaks by perchlorinating the sample extracts according to the method originally developed by the Laboratory Services Branch of MOE.

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